

REMARKS

This is in response to the final Office Action dated October 1, 2004. The response is filed with a request for continued examination so that the accompanying information disclosure statement can be considered. The final Office Action rejects the claims over U.S. Patent No. 5,712,865 to Chow, et al. (the Chow patent). Applicant respectfully submits that the Chow patent does not describe or suggest the invention defined in the pending claims. Reexamination and early favorable action are respectfully requested.

The present application describes a semiconductor laser that has a vertical cavity configuration. A pertinent implementation of the application's laser is shown in FIG. 2, described in the application at pages 7 and 8. Referring to FIG. 2, the vertical cavity is defined by the second order grating 10 (distributed Bragg reflector) provided over the active layer 3, which is a multiple quantum well structure and provides gain for the laser. Viewed as in FIG. 2, the application's laser desirably emits light upwardly in the plane of the page. Preferred embodiments of the present invention avoid undesirable lateral (horizontal as viewed in FIG. 2) oscillations that can reduce the efficiency of vertical cavity lasers.

As described at page 8, "[S]ide surfaces 60' of the device including edges of the active layer 3 and the waveguide layer 5 are configured to slant relative to the major surface of the substrate 1. That is, side surfaces 60' are not cleaved surfaces but are processed to be aslant. These slants can be made, for example, by configuring both these side surfaces to define certain crystalline planes ((111)-oriented) With this aslant facet structure, undesirable horizontal resonance by reflection from edges can be restricted."

Preferred embodiments of the present invention provide vertical cavity lasers that suppress lateral or horizontal oscillations. Preferably this is accomplished by

slanting or angling the planar sides of the vertical cavity laser as shown in FIGS. 2 and 3, for example.

This aspect of the application's laser structure is reflected in pending claim 1, for example, which recites "said active layer having planar side surfaces which are offset from vertical planes normal to said major surface of said semiconductor substrate to prevent in-plane horizontal resonance of light in said active layer."

The invention of claim 1 is neither taught nor suggested by the Chow patent. The Chow patent describes a vertical cavity laser as illustrated in FIG. 1. As set forth in column 4, the FIG. 1 laser has an active region 18 sandwiched between distributed Bragg reflectors 14 and 16. The Chow patent does not describe the side surfaces of the active region 18 and so does not teach that the side surfaces of the active region 18 are either "planar" or "offset from vertical planes normal" to the major surface of the semiconductor substrate. Nor does the Chow patent teach or describe preventing "in-plane horizontal resonance of light in said active layer."

Consequently claim 1 distinguishes over the art of record and is in condition for allowance.

Claim 2 similarly distinguishes over the cited art by reciting: "said active layer having side surfaces at the longitudinal ends of the active layer, the side surfaces of said active layer offset from vertical planes normal to the major surface of said semiconductor substrate." As with claim 1, the Chow patent does not describe the side surfaces of its active layer 18 and neither teaches nor suggests that those (undescribed) side surfaces would be "offset from vertical planes normal to the major surface of said semiconductor substrate." Consequently claim 2 and its dependent claims 3-16 distinguish over the Chow patent and the other art of record and are in condition for allowance.

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Claim 17 and its dependent claims 18-19 similarly distinguish over the art of record by reciting, "any of side surfaces of said substantially rectangular element being cleaved surfaces and the cleaved surfaces are offset from the vertical planes normal to the first major surface of the semiconductor substrate."

Finally, claim 20 distinguishes over the Chow patent and the other art of record by reciting, "said active layer having planar side surfaces which are offset from vertical planes normal to said major surface of said semiconductor substrate to prevent in-plane horizontal resonance of light in said active layer." Nowhere does the Chow patent teach or suggest that the side surfaces of the active layer should be offset from vertical and so claim 20 distinguishes over the Chow patent. None of the other art of record suggests modifying this deficiency of the Chow patent and so claim 20 distinguishes over the art of record and is in condition for allowance.

In view of the foregoing, it is respectfully submitted that the application is in condition for allowance. Reexamination and reconsideration of the application, as amended, are requested.

If for any reason the Examiner finds the application other than in condition for allowance, the Examiner is requested to call the undersigned attorney at the Los Angeles, California telephone number (213) 337-6700 to discuss the steps necessary for placing the application in condition for allowance.

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If there are any fees due in connection with the filing of this response, please charge the fees to our Deposit Account No. 50-1314.

Respectfully submitted,

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Date: December 30, 2004

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